

## Description

# LOCKING MEMBER FOR AN OPTICAL DISK DRIVE

### CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation-in-part of US patent application serial no.10/605914, filed 11/06/2003, which is included in its entirety herein by reference.

### BACKGROUND OF INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to an optical disk drive, and in particular, to a locking member that is effective at resisting impact or shock that may be experienced by the optical disk drive.

[0004] 2. Description of the Prior Art

[0005] Optical disk drives are becoming more popular in the market, having been considered standard equipment on personal computer for several years. Recently, slim-type optical disk drives, which can be used to conveniently load

and unload optical disks, are being shipped with portable computers such as notebooks. In an attempt to reduce the cost and adapt to the limited space constraint within notebooks, the conventional motor for disk loading and unloading operations has been eliminated. FIGS. 1–4 illustrate a conventional disk drive and its loading and unloading device. The conventional disk drive has a chassis 1, a disk tray 2, a playback unit 3, a locking mechanism 4, and a locking member 5. The disk tray 2 and the playback unit 3 are positioned inside the chassis 1, and the playback unit 3 is positioned above the disk tray 2. When the tray 2 is ejected along the direction of arrow A as shown in FIGS. 1 and 2, the user can place an optical disk on the playback unit 3 and then push the disk tray 2 back into the chassis 1 along the reverse of the direction of arrow A.

[0006] Referring to FIG. 2, the conventional locking mechanism 4 is positioned on the disk tray 2 and inside the chassis 1 and functions to prevent the disk tray 2 from being inadvertently ejected when the optical disk drive is in use. The locking member 5 is secured to the chassis 1 by riveting and is positioned near a front panel 10 of the disk tray 2 as shown in FIG. 1. When the optical disk drive is being transported from one location to another, shock and other

impact are inevitable. In this regard, if the shock or impact is applied along the direction of arrow A in FIGS. 1 and 2, the energy will be absorbed by the locking member 5. As shown in FIG. 3, if the optical disk drive is subjected to large shock or impact along the direction of arrow A, the locking mechanism 4 will supply a large bending moment and shear force to the locking member 5. Referring to FIG. 4, the connection between the locking member 5 and the chassis 1 is indicated by the arrow C. If the energy of the shock is too large, the locking member 5 will fracture or fail. Once the locking member 5 is bent or broken, the disk tray 2 cannot be locked inside the chassis 1, thereby rendering the optical disk drive unusable.

[0007] Thus, there is a need to develop an optical disk drive locking member that is small in size and capable of withstanding high impact without breakage.

## SUMMARY OF INVENTION

[0008] It is an object of the present invention to provide a locking member that can effectively withstand a large impact for use in an optical disk drive.

[0009] It is another object of the present invention to provide a locking member that is suitable for use in a slim-type disk drive.

[0010] In order to accomplish the objects of the present invention, the present invention provides a locking member for use in an optical disk drive. The locking member includes a rivet and a hollow element. A hole defined on the chassis of the optical disk drive is sized to receive the rivet, and the rivet extends through the hollow element. The rivet can be fixed on the chassis by riveting, and the locking member can absorb the large impact or shock. Alternatively, a screw thread can be integrally formed with the hollow element and the rivet. The rivet can be threaded through to engage with the hollow element to absorb the impact or shock without breakage or failure of the locking member.

#### **BRIEF DESCRIPTION OF DRAWINGS**

- [0011] The present invention can be fully understood from the following detailed description and preferred embodiment with reference to the accompanying drawings in which:
- [0012] FIG. 1 is a perspective view of a conventional optical disk drive with a top cover removed;
- [0013] FIG. 2 is a perspective view of a chassis and a locking mechanism of the conventional optical disk drive;
- [0014] FIG. 3 is a partially enlarged perspective view of the conventional optical disk drive of FIG. 2;

- [0015] FIG. 4 is a cross-sectional view of the locking member of the conventional optical disk drive taken along the line B-B;
- [0016] FIG. 5 is a top plan perspective view of the optical disk drive in accordance with the present invention with top cover removed;
- [0017] FIG. 6 is a perspective view of a locking member in accordance with the present invention with the top cover and the disk tray removed;
- [0018] FIG. 7 is a partially enlarged perspective view of a first embodiment of the present invention of FIG. 5;
- [0019] FIG. 8 is an exploded view of the first embodiment of the locking member in accordance with the present invention;
- [0020] FIG. 9 is a cross-sectional view of the first embodiment of the locking member in accordance with the present invention;
- [0021] FIG. 10 is a cross-sectional view of a second embodiment of the locking member in accordance with the present invention;
- [0022] FIG. 11 is a partially enlarged perspective view of third embodiment of the present invention of FIG. 5;
- [0023] FIG. 12 is an exploded view of the third embodiment of the locking member in accordance with the present invention.

tion;

[0024] FIG. 13 is a cross-sectional view of the third embodiment of the locking member in accordance with the present invention before riveting; and

[0025] FIG. 14 is a cross-sectional view of the third embodiment of the locking member in accordance with the present invention after riveting.

## DETAILED DESCRIPTION

[0026] The following detailed description is of the best presently contemplated modes of carrying out the invention. This description is not to be taken in a limiting sense, but is made merely for the purpose of illustrating general principles of embodiments of the invention. The scope of the invention is best defined by the appended claims.

[0027] Although the embodiments of the present invention are described below in connection with slim-type DVD-ROM drives, the present invention can be applied to all optical disk drives, including but not limited to CD-ROM drives, CD-RW drives, DVD-RAM drives, DVD-RW drives, DVD+RW drives, COMBO drives, car audio players, external drives, as well as all other optical media recorders and players.

[0028] Referring to FIGS. 5 and 6, the optical disk drive of the

present invention includes a chassis 11, a disk tray 12 and a playback unit 13 that can be the same as the chassis 1, disk tray 2 and playback unit 3 of the conventional optical disk drive. The disk tray 12 and the playback unit 13 are positioned inside the chassis 11, and the playback unit 13 is positioned above the disk tray 12. When the disk tray 12 is ejected along the direction of arrow A as shown in FIG. 5, the user can place an optical disk on the playback unit 13 and then push the disk tray 12 back into the chassis 11. Referring to FIG. 6, the locking mechanism 14 and the locking member 15 are positioned on the disk tray 12 and inside the chassis 11 and function to prevent the disk tray 12 from being inadvertently ejected when the optical disk drive is in use. The locking member 15 is effective in absorbing the energy of shock or impact.

[0029] FIGS. 7 and 8 illustrate a first embodiment of the locking member in accordance with the present invention. Referring to FIGS. 7 and 8, the locking member 15 includes a hollow element 21, a protuberance 22 and a rivet 23. The hollow element 21 includes a base 31 and a rod 32. A hollow portion 33 extends downwardly from a top surface of the hollow element 21. The protuberance 22 is formed with the chassis 11 by a suitable manufacturing process

(i.e. cold working), and a hole 34 is integrally formed with the protuberance 22. The rivet 23 includes a base 35 and a tubular projection 36. A recess 37 is integrally formed with the top surface of the tubular projection 36, and an enlarged portion 38 is integrally formed with the bottom of the tubular projection 36.

[0030] Further referring to FIGS. 7 and 8, during manufacture, the hollow element 21 is placed on the protuberance 22, and the base 31 is aligned with the protuberance 22 because the size of the base 31 is substantially the same as that of the protuberance 22. Then, the tubular projection 36 of the rivet 23 is inserted through the hole 34 of the protuberance 22 from the bottom of the chassis 11. Further, the hollow portion 33 of the hollow element 21 is sized to receive the tubular projection 36 of the rivet 23. The enlarged portion 38 of the rivet 23 is adapted to be fitted into the hole 34 of the protuberance 22. Finally, the recess 37 of the rivet 23 is subjected to an external force (e.g. riveting) so that the locking member 15 is fixed on the chassis 11 of the optical disk drive. Alternatively, a screw thread can be integrally formed on the inner surface of the hollow element 21. Likewise, a corresponding screw thread can also be integrally formed on the outer surface

of the tubular projection 36. Then, after the hollow element 21 is placed on the protuberance 22, the base 31 can be substantially aligned with protuberance 22. Thus, the tubular projection 36 of the rivet 23 can thread through and engage with the hollow portion 33 of the hollow element 21 because of the screw threads formed on both the hollow element 22 and the rivet 23.

[0031] Referring to FIGS. 7 and 8, the present invention provides an alternative of the locking member 15. A screw thread is integrally formed on the outer surface of the tubular projection 36, and there is no screw thread formed on the hollow portion 33 of the hollow element 21. Before the locking member 15 is fixed onto the chassis 11, the tubular projection 36 of the rivet 23 must be pushed through the hollow portion 33 of the hollow element 21 by an external torque or force. According to the present invention, the locking member 15 can withstand larger shock and impact compared to the prior art no matter whether the screw thread is integrally formed with the hollow element 21, with the rivet 23, or with both of them.

[0032] FIGS. 9 and 10 respectively illustrate the first and second embodiments of the locking member 15 in accordance with the present invention. Further referring to FIG. 9, as

described above, the locking member 15 includes the hollow element 21, the protuberance 22, and the rivet 23. The tubular projection 36 of the rivet 23 can be inserted through the hole 34 of the protuberance 22, and slidably thread through the hollow portion 33 of the hollow element 21. Thus, the recess 37 will be subjected to riveting (i.e. cold working), preventing the rivet 23 from sliding from the chassis 11, such that the rivet 23 is firmly fixed to the chassis 11. Referring to FIG. 9, the hollow element 21 and the rivet 23 can be made of, but are not limited to metal, plastic, brass, etc. Furthermore, the shapes of the base 35 and the tubular projection 36 of the rivet 23 can be, but are not limited to a circle, a square, a triangle, or a polygon, etc. Alternatively, the hollow element 21 and the rivet 23 are not configured with a screw thread, and thus, the locking member 15 can be fixed on the chassis 11 only by riveting.

[0033] FIG. 10 illustrates the second embodiment of the locking member 15 in accordance with the present invention. The locking member 15 includes a bushing 211, a washer 212, the protuberance 22, and the rivet 23. A screw thread is integrally formed on the inner surface of the bushing 211. The rivet 23 extends through the washer

212 and the hole 34 of the protuberance 22, and slidably engages with the bushing 211. The bushing 211 is sized to receive the tubular projection 36, and the recess 37 of the rivet 23 is subjected to a proper force (e.g. by riveting) so that the locking member 15 will be fixed on the chassis 11. The bushing 211, the washer 212, and the rivet 23 can be made of, but are not limited to metal, plastic, brass, etc. Furthermore, the shapes of the base 35 and the tubular projection 36 of the rivet 23 can be, but are not limited to a circle, a square, a triangle, or a polygon,etc. Alternatively, the bushing 211, the washer 212, and the rivet 23 are not configured with a screw thread, and thus, the locking member 15 can be fixed on the chassis 11 only by riveting.

[0034] FIGS. 11 and 12 illustrate the third embodiment of the locking member in accordance with the present invention. FIG. 11 illustrates the locking member 15 fixed on the bottom of the chassis 11 of the optical disk drive after the locking member 15 has been subjected to riveting. Referring to FIG. 12, the locking member 15 includes a base 45, a tubular projection 46, and an enlarged portion 48. The enlarged portion 48 is integrally formed with the base 45 and the tubular projection 46. The tubular projection

46 and the enlarged portion 48 of the locking member 15 can penetrate through a hole 41 from the bottom of the chassis 11.

[0035] FIG. 13 is a cross-sectional view of the third embodiment of the locking member in accordance with the present invention before riveting. FIG. 14 is a cross-sectional view of the third embodiment of the locking member in accordance with the present invention after riveting. Referring to FIG. 13, the enlarged portion 48 of the locking member 15 can be adapted to fit into the hole 41 of the chassis 11. The enlarged portion 48 of the locking member 15 is subjected to an external force (e.g. by riveting), as shown by arrow F, and thus experiences a plastic deformation. In addition, a deformed portion 42 is integrally formed in the chassis 11 and the enlarged portion 48 of the locking member 15 is reduced to a flat portion 49 by the riveting process. Referring to FIG. 14, the base 45 of the locking member 15 is embedded in the chassis 11, and the bottom surface of the base 45 is substantially aligned with the bottom surface of the chassis 11. Thus, the locking member 15 can be fixed on the chassis 11 of the optical disk drive by the riveting process as shown in FIG. 14.

[0036] Referring to FIGS. 13 and 14, the present invention pro-

vides an alternative of the locking member 15. A screw thread is integrally formed on the outer surface of the enlarged portion 48, and there is no screw thread formed on the hole 41 of the chassis 11. Before the locking member 15 is fixed on the chassis 11, the locking member 15 must be pushed through the hole 41 of the chassis 11 by an external torque or force. According to the present invention, the locking member 15 can withstand larger shock and impact compared to the prior art no matter whether the screw thread is integrally formed with the hole 41, with the enlarged portion 48, or with both of them. When the hole 41 of the chassis 11 is also configured with the screw thread, the enlarged portion 48 of the locking member 15 threads through the hole 41 of the chassis 11. The enlarged portion 48 will be subjected to riveting, thereby preventing the locking member 15 from sliding from the chassis 11, such that the locking member 15 is firmly fixed to the chassis 11. Referring to FIGS. 13 and 14, the locking member 15 can be made of, but is not limited to metal, plastic, brass, etc. Furthermore, the shapes of the base 45 and the enlarged portion 48 of the locking member 15 can be, but are not limited to a circle, a square, a triangle, or a polygon, etc. Alternatively, the

locking member 15 and the hole 41 are not configured with a screw thread, and thus, the locking member 15 can be fixed on the chassis 11 only by riveting.

- [0037] When compared with the conventional locking mechanism, the locking member 15 of the present invention can withstand a larger shock or impact to the optical disk drive. If the locking member 15 and the prior art locking mechanism are under the same conditions, the locking member 15 has a larger connection cross-sectional area resulting in less shear stress. In addition, the larger cross-sectional area of the locking member 15 of the present invention can withstand a larger moment and related bending stress without breakage and failure.
- [0038] While the invention has been described with reference to the preferred embodiments, the description is not intended to be construed in a limiting sense. It is therefore contemplated that the appended claims will cover any such modifications or embodiments as may fall within the scope of the invention defined by the following claims and their equivalents.